

# **Energy 2003**

## **Utility Basics**



***Presented by:***

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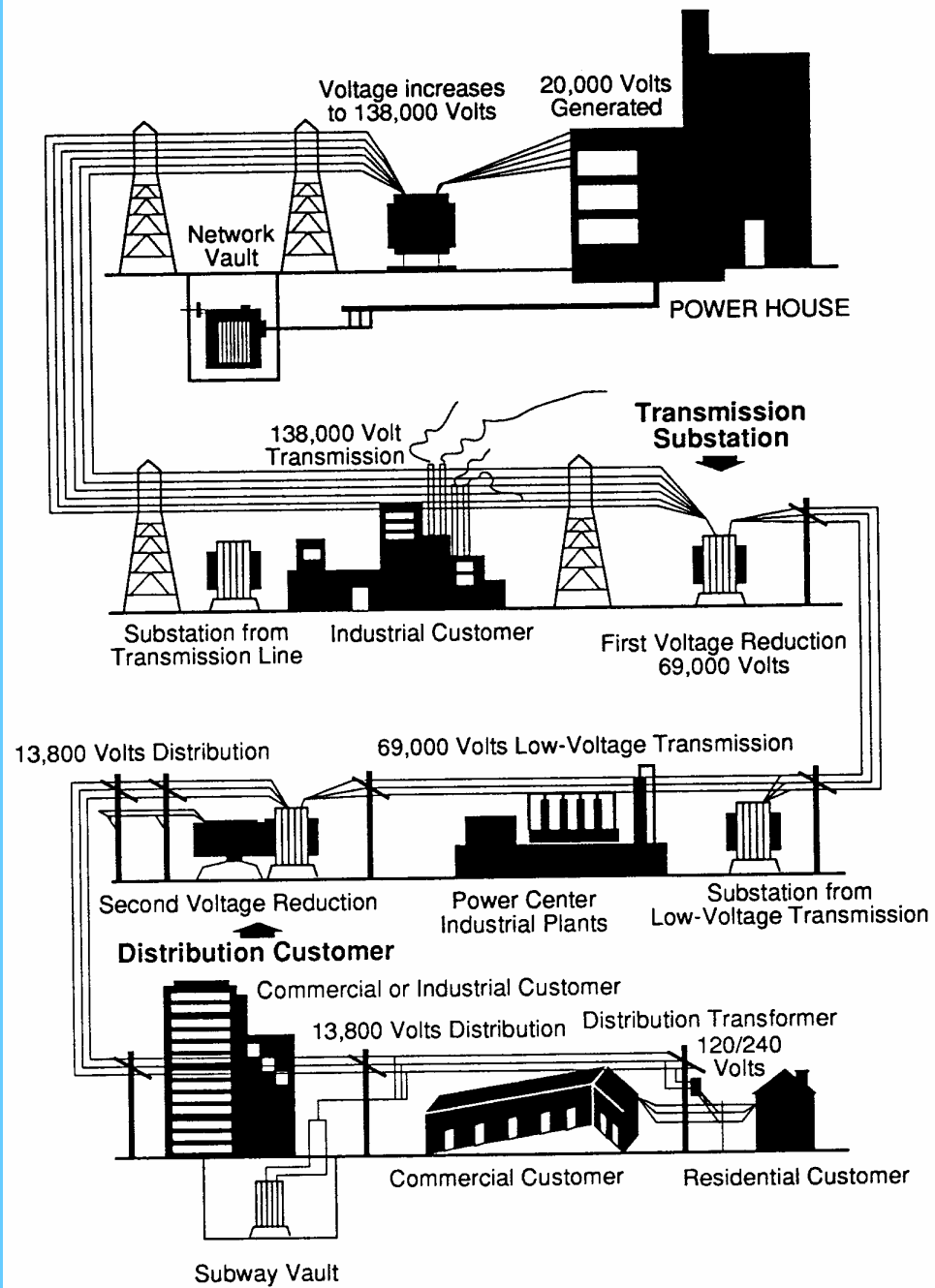
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**GSA Contract 10F-0494M**

# Electrical Systems

- Generation (three-phase)
- Transmission
- Distribution



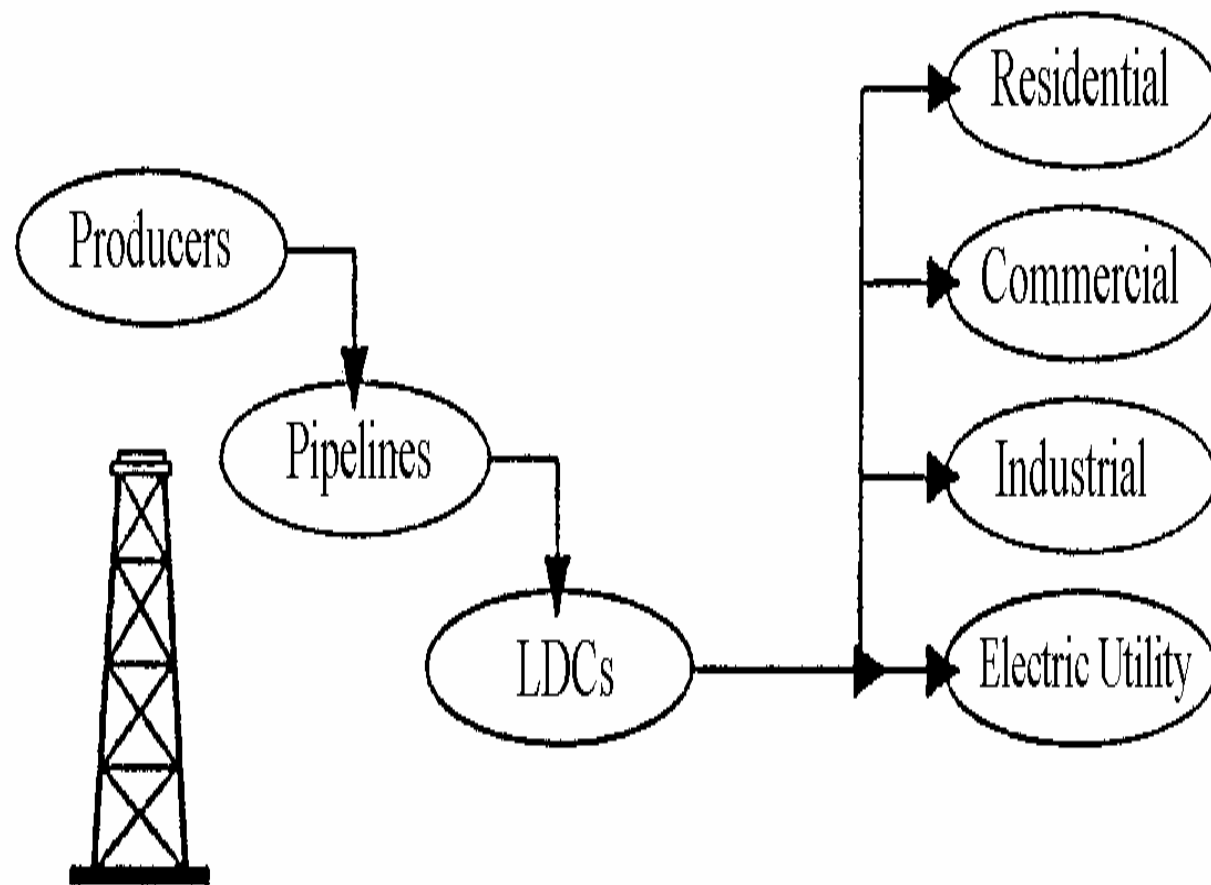
# Distribution Transformers



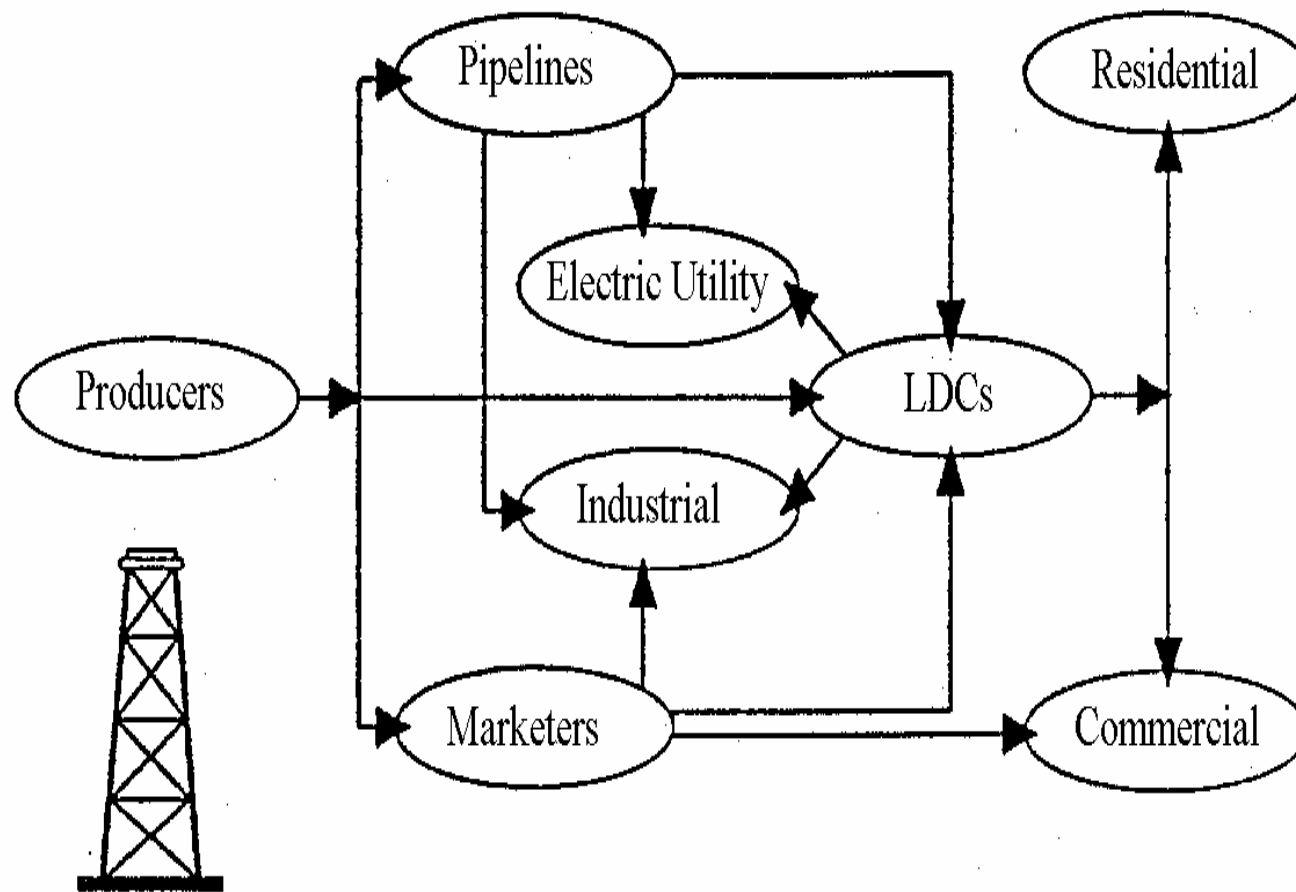
# Natural Gas Systems

- Production
- Transmission (pipelines) and storage
- Distribution-LDCs

# Gas Before Deregulation



# Gas After Deregulation





# Energy and Power Terms

- Electrical systems
- Thermal (natural gas) systems

## Electric

## Thermal

Power

**kW**

**BTU/HR**

Energy

**kWh**

**BTU, therms**  
**MCF**

$$\text{Energy} = \text{Power} \times \text{hours}$$

$$\text{kWh} = \text{kW} \times \text{hours}$$

$$\text{Btus} = \text{Btu/hr} \times \text{hours}$$

**Example:** Calculate the demand and energy usage of ten- 100 Watt light bulbs operating 2,000 hours per year.

**Solution:**

$$\text{kW} = \frac{10 \text{ lights} \times 100\text{W/light}}{1000\text{W/kW}} = 1 \text{ kW}$$

$$\text{kWh} = 1 \text{ kW} \times 2,000 \text{ hrs/yr} = 2,000 \text{ kWh/yr}$$

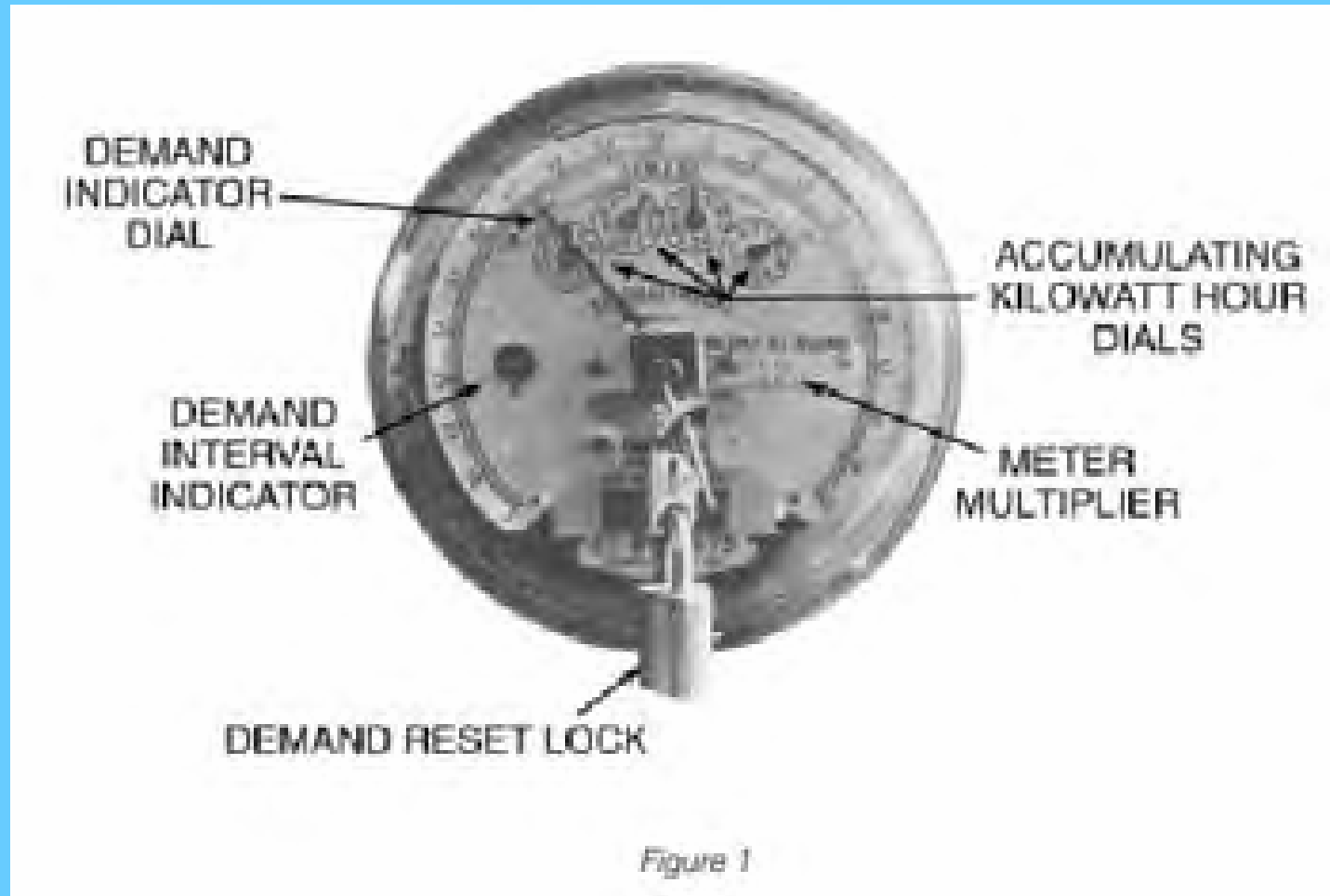
## **Metering electrical:**

- KWh
- KW
- KVAR

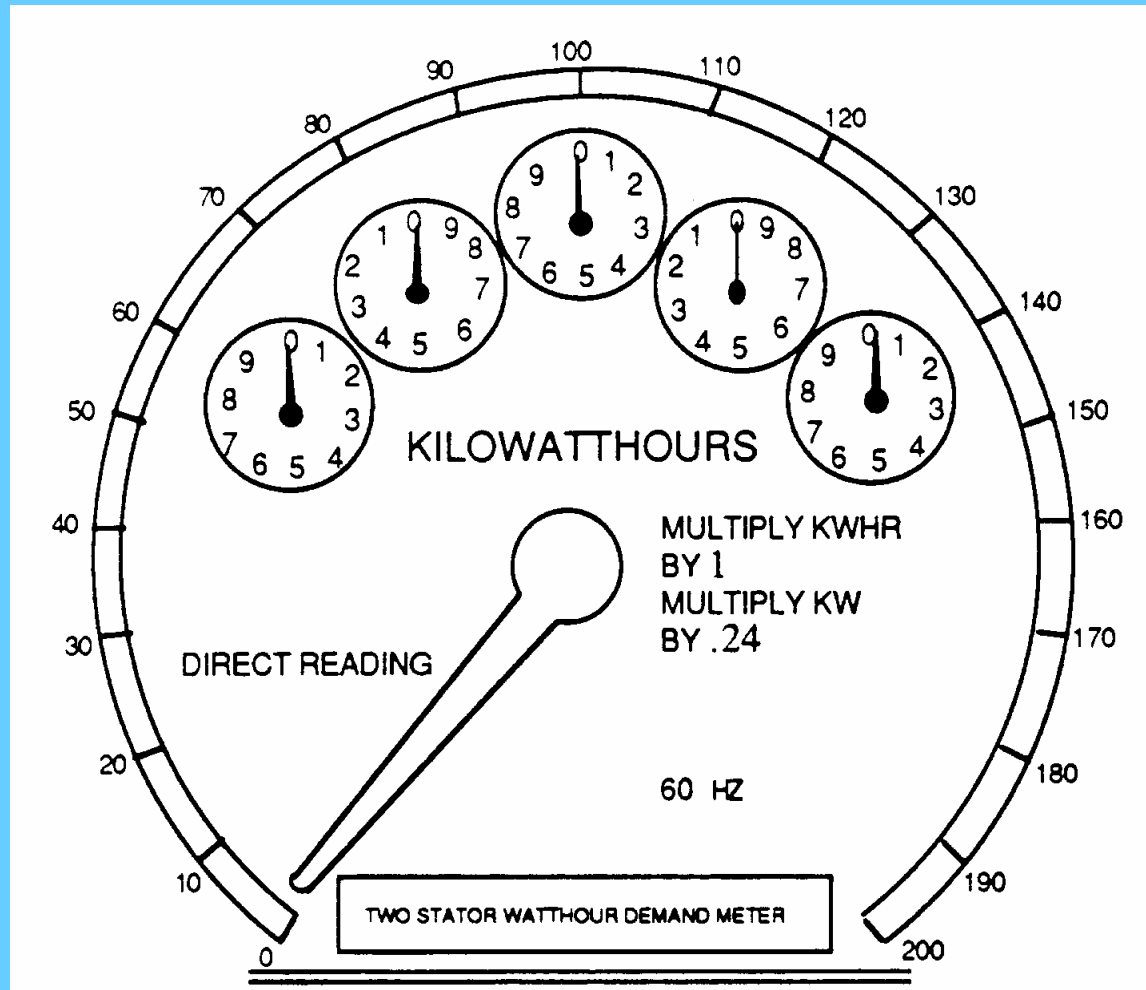
# KWH meter



# Demand meter



# Demand meter





## Gas metering:

- Typically measure volume in CF or MCF
- 1 CF ~ 1000 Btus
- A heat content factor is used to convert to BTUs or therms (100,000 Btus = 1 therm)

# Gas meter



## **Metering problems:**

- Meters usually are accurate
- Meter readers do make errors

**Note:** Plotting monthly data can help find errors

# **Metering problems-case history:**

**“Identical Buildings”**

# **Rates- bill components**

- Customer charge
- Energy (kWh) charge
- Fuel adjustment

## **Rates- bill components (cont.)**

- Demand (kW) charge
- Power factor penalty charge
- Taxes and franchise fees
- Misc. charges

## Utility rate example 1:

A commercial customer has set a peak demand of 100 kW and has used 200,000 kWh for the year. Calculate the annual bill using the following:

**Customer Charge:     \$10.00 per month**

**Demand Charge:     \$ 8.50 per kW-month**

**Energy Charge:             \$ 0.08 per kWh**

**Fuel Adjustment:     \$ 0.01 per kWh**

**Taxes:                     5%**



**Customer Charge:**  $\$10.00/\text{mo} \times 12 \text{ mo} = \$120$

**Demand:**  $\$ 8.50/\text{kW-mo} \times 100 \text{ kW} \times 12 \text{ mo} = \$10,200$

**Energy Charge:**  $\$0.08/\text{kWh} \times 200,000 \text{ kWh} = \$16,000$

**Fuel Adj:**  $\$0.01 \text{ per kWh} \times 200,000 \text{ kWh} = \underline{\$2,000}$

**Total:**  $\$28,320$

Total with taxes:  $\$28,320 \times 1.05 = \$29,736$

## **Utility rates example 2:**

A hospital has a peak demand of 500 kW. During the month of August, the kWh consumption is 250,000 kWh.

Calculate the August energy bill using the following information from the rate schedule.

**Customer Charge:** \$12.00

**Demand Charge:** \$ 10.00 per kW

**Energy Charges:**

<b>First</b>	100 kWh @ 10.5 cents
<b>Next</b>	900 kWh @ 8.7 cents
<b>Next</b>	9,000 kWh @ 7.5 cents
<b>Next</b>	10,000 kWh @ 6.5 cents
<b>Next</b>	180,000 kWh @ 5.7 cents
<b>Over</b>	200,000 kWh @ 5.0 cents

**Fuel Adjustment Charge for August:** 1.2 cents/kWh

**Taxes:** 6%

## **Rate Classes:**

- Residential
- Commercial
- Industrial
- Time of use

## **Rate Classes (cont.):**

- Interruptible
- Real time pricing
- Economic development
- Master metering

## **Steps to minimize utility bills:**

- Familiarize yourself with the various rates your utility offers –know your rep!
- Ensure that you are on the best rate
- Negotiate with your utility

## **Steps to minimize utility bills (cont):**

- Have an energy audit done
- Consider using an ESCO
- Track usage

# Energy accounting:

- Track energy usage and costs
- Detect changes in usage patterns
- Detect unused facilities and billing errors
- And finally....



**Detect buildings that are “energy hogs”**



# **Questions/Discussion**